REMARKS

Claims 1-3, 5-16, 18, 19, 22-25, 45, 46, 52, and 221-241 are currently pending. By way of present response, claims 5, 6, 10, 14-16, 46, 52, 224, 228, 235, and 241 have been amended to more particularly point out and distinctly claim the subject matter which Applicant regards as the invention.

Claim Rejections - 35 U.S.C. § 112

The Examiner has rejected claims 1-3, 5-16, 18, 19, 22-25, 45, 46, 52, and 221-241 under 35 U.S.C. § 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which Applicant regards as the invention.

With respect to claim 1, the Examiner states that "[t]he claims are indefinite because it is not clear what structure is required by the text introduced by "wherein" in claim 1." In response to the Examiner's comments Applicant respectfully submits that both the structural and functional language following the phrase "wherein" are required claim elements that limit the claim to a particular structure. Features of an apparatus may be recited either structurally or functionally. M.P.E.P § 2114 citing *In re Schreiber*, 128 F.3d 1473, 1477-78, 4 USPQ2d 1429, 1431-32 (Fed. Cir. 1997).

With respect to claim 241, the Examiner states that "[c]laim 241 is indefinite because the term "approximately" is a relative term. Applicant has amended claim 241 to remove the term "approximately."

Accordingly, Applicant submits that claims 1-3, 5-16, 18, 19, 22-25, 45, 46, 52, and 221-241 comply with the requirements of 35 U.S.C. § 112, second paragraph, and requests the withdrawal of the rejections.

Claim Rejections - 35 U.S.C. § 102

The Examiner has rejected claims 1-3, 5-11, 15, 19, 22,-25, 45, 46, 52, 224-226, 229-231, 235-237, and 239-241 under 35 U.S.C. § 102(e) as being anticipated by *Lorimer* (US Patent No. 6,460,552), citing the entire document, especially Figures 4, 6, 7a and the related description and columns 9-12.

Claims 1-3, 5-11, 15, 19, 22,-25, 45, 46, 52, 224-226, 229-231, 235-237, and 239-241

Applicant teaches and claims an apparatus which comprises a first liquid dispenser for flowing a first liquid between an acoustic energy generator and a wafer, and a second liquid dispenser for flowing a process liquid from the second liquid dispenser and onto a device side of a wafer. The apparatus taught and claimed by Applicant allows acoustic energy to be transferred from the acoustic energy generator to the first liquid, and to the non-device side of the wafer, through to the device side of the wafer, and then to the process liquid on the device side of the wafer.

It is Applicant's understanding that *Lorimer* fails to disclose a second liquid dispenser which flows a process liquid from the second liquid dispenser. Instead *Lorimer* discloses an apparatus which applies filtered, high purity steam, **which is a vapor and not liquid**, to an active surface of a wafer. Specifically, *Lorimer* discloses a workpiece cleaning system including "a vapor phase inlet positioned to apply a vapor phase at a first temperature to a first surface of the work piece." See col. 4, lines 55-56. In fact, *Lorimer* repeatedly and consistently states that the device includes a steam inlet/nozzle for applying steam to the active surface of the wafer. For example, see Abstract; FIG. 1a; FIG. 2a; FIG. 7; col. 4, line 13; col. 4, line 32; col. 5, line 7; col. 5, line 31; col. 6 line 1; col. 7, line 38; col. 8, line 64; col. 9, line 5; col. 10, line 7; col. 10, line 8; col. 10, line 34; col. 10, line 45; col. 11, line 28; col. 11, line 56; col. 11, line 60; col. 12, line 13. Accordingly, *Lorimer* does not disclose a second liquid dispenser for flowing a liquid from the second liquid dispenser.

The Examiner states that Applicant's previous arguments distinguishing a liquid and vapor are not persuasive because:

i) "the apparatus of Lorimer is **capable of delivering a liquid**"

ii) "the **claims do not exclude delivering liquid as a vapor**"

iii) "Lorimer teaches **condensation of the vapor on the wafer**. The fact that Lorimer recommends filtering the liquid in a vapor state does not change the fact that the liquid is delivered to the wafer"

However, the current state of the claims requires "a second liquid dispenser for flowing a processing liquid ***from*** the second liquid dispenser." ***Lorimer* only discloses a vapor phase inlet**. Firstly, the inlet is not capable of dispensing a liquid. Secondly, vapor is not a liquid, and it is irrelevant if Applicant's claims do not exclude "delivering" a vapor. Thirdly, the fact that *Lorimer* teaches condensing vapor on a wafer does not change the fact that liquid does not flow from the inlet, rather gaseous vapor flows from the inlet of *Lorimer*.

i) The steam inlet in *Lorimer* is not capable of flowing a liquid.

Lorimer discloses that:

> The steam is **filtered in its gaseous phase**, and then is applied to the active wafer surface via the **inlet 146** of the chamber 48. This is very advantageous since filtering efficiency is much higher for the gaseous phase of water versus the liquid phase of water. This filtering of the gaseous phase therefore ensures a very high purity steam being applied to the active surface of the wafer. (col. 11, lines 54-60, emphasis added).

Lorimer further discloses that "

> A **steam generator 154 is preferably coupled to the inlet 146** by a valve system 156 and a filter 158. A preferred steam generator 154 construction is disclosed in U.S. Pat. No. 5,063,609 **the disclosure of which is incorporated herein by reference for all purposes**" (col. 11, lines 27-31, emphasis added).

U.S. Pat. No. 5,063,609, which was incorporated for all purposes in *Lorimer*, is also issued to D'Arcy Lorimer, and hereinafter is referred to by Applicant as

"*Lorimer2*." As discussed in detail in col. 5 – col. 6 of *Lorimer2*, filtering steam in the gaseous state is **required** in order to remove impurities **for ultra high purity applications** such as those disclosed in *Lorimer*. *Lorimer2* expressly teaches that the steam filtering system of *Lorimer2* is both (1) more efficient and less complicated than a liquid water filtering system (see col. 5, lines 53-68), and (2) that a liquid water filtering system is not as affective as filtering impurities as a steam filtering system is (see col. 6, liens 5-9). Accordingly, in the steam filtering system of *Lorimer2*, "The **steam released is of an ultra high purity**, suitable for **applications *requiring* pure steam**" (col. 5, lines 25-26). Accordingly, in such an application where steam is ***required***, "the steam is condensed and utilized at the point of use, thereby substantially avoiding any problems of bacteria growth" (col. 3, lines 2-4).

The description contained in *Lorimer2* is entirely consistent with Applicant's characterization of *Lorimer*. Like *Lorimer2*, *Lorimer* discloses that the ultra high purity steam is condensed and utilized at the point of use. *Lorimer2* discloses that ultra high purity steam is released through steam outlet 31. Accordingly, since *Lorimer* incorporates *Lorimer2* for "all purposes," where *Lorimer* discloses that inlet 146 is coupled to steam generator 154 in FIG. 7, this necessarily means that inlet 146 of *Lorimer* is coupled to steam outlet 31of *Lorimer2*. *Lorimer* discloses that this necessary connection is preferably connected by tubing 160 and 162, valve assembly 156, and filter 158 "to prevent the steam from condensing" (col. 11, line 40). Thus, not only is steam ***required*** in the apparatus of *Loirmer*, additional safeguards to prevent the steam from condensing are preferably including in the design. Therefore inlet 146 is **incapable of dispensing a liquid**.

ii) Vapor is not a liquid, and it is irrelevant if the claims do not exclude "delivering" a vapor

Applicant claims in claims 1-3, 5-16, 18, 19, 22-25, 45, 46, 52, and 221-241 "a second **liquid dispenser** for flowing a processing liquid ***from*** the second liquid dispenser and onto the device side of the wafer." Thus, Applicant claims a liquid dispenser for flowing a liquid.

Applicant respectfully submits that the Examiner's statement regarding whether or not Applicant's claims exclude "delivering liquid as a vapor" is not consistent with the claim language and fails to appreciate the distinction of a vapor state and liquid state.

Firstly, Applicant does not claim "delivering" a liquid. This term is not found in the claim language. Rather, Applicant claims a liquid dispenser for "flowing" a liquid. Secondly, a vapor is in a gaseous state, and therefore by definition is not a liquid. A vapor can correctly be characterized as a fluid, but not a liquid. Therefore, Applicant's claims necessarily do exclude "flowing a liquid as a vapor."

As described in detail in the argument above, *Lorimer* discloses applying an ultra high purity steam, which is in a gaseous state, to the active surface of a wafer via the inlet 146 of the chamber 48. Thus, *Lorimer* necessarily discloses "flowing" steam, which is in a gaseous state, ***from*** inlet 146.

Therefore, Applicant respectfully submits that the Examiner's statement regarding "delivering liquid as a vapor" does not effectively rebut Applicant's arguments distinguishing a dispenser for flowing a liquid and as opposed to a vapor.

iii) The fact that *Lorimer* teaches condensing vapor on a wafer does not change the fact that liquid is not flowed from the inlet

As described in detail in the arguments above, *Lorimer* discloses applying an ultra high purity steam, which is in a gaseous state, to the active surface of a wafer via

the inlet 146 of the chamber 48. The Examiner is correct that *Lorimer* discloses that the gaseous vapor then condenses on the surface of the wafer. However, the change in state of vapor-to-liquid on the surface of the wafer in *Lorimer* does not change the fact that *Lorimer* does not disclose a liquid dispenser for flowing a liquid. The fact that the vapor in a gaseous state that is flowed from the inlet 146 later condenses to form a liquid does not change the fact that *Lorimer* requires that inlet 146 is a vapor inlet for flowing vapor in a gaseous state.

Applicant, therefore, respectfully requests removal of the 35 U.S.C. 102(e) rejections of claims 1-3, 5-11, 15, 19, 22,-25, 45, 46, 52, 225-226, 229-231, 236-237, and 239-241 and seeks an early allowance of these claims.

Claims 6 and 52

With respect to dependent claims 6 and 52, Applicant claims an apparatus comprising a wafer bracket that is rotatable relative to a platter, the platter having one or more transducers mounted or attached to the backside. In contrast, as is evidenced in col. 9, lines 25-50; and col. 10, lines 36-38, *Lorimer* discloses an apparatus in which a wafer 30 is held above the upper surface 97 of the platen portion 96 of the chuck 82 by pins 100. Thus, when the chuck 82 spins, the platen 96, pins 100, and wafer 30 spin at the same rate. Accordingly, *Lorimer* fails to disclose a wafer bracket that is rotatable relative to a platter having one or more transducers mounted or attached to the backside.

Applicant, therefore, respectfully requests removal of the 35 U.S.C. 102(e) rejections of claims 6 and 52 and seeks an early allowance of these claims.

Claims 12, 14, 15, 46, and 228

With respect to dependent claims 12, 14, 15, 46, and 228, Applicant claims an apparatus comprising a wafer bracket that is rotatable relative to a platter, the platter having

one or more transducers mounted or attached to the backside to cover a certain percentage of the wafer or platter.

Lorimer only discloses that ultrasonic transducers may be optionally attached to the underside of the platen portion 98 of chuck 82. See Col. 9, lines 41-21. As discussed above for claims 6 and 52, *Lorimer* fails to disclose a wafer bracket that is rotatable relative to a platter. Additionally, *Lorimer* fails to disclose that the ultrasonic transducers 108 cover a certain percentage of the wafer or platter beyond what is discernable from FIG. 4.

Applicant, therefore, respectfully submits that *Lorimer* does not disclose or suggest all the limitations of claims 12, 14, 15, 46, and 228, and requests removal of the 35 U.S.C. 102(e) rejections.

Claims 224 and 235

With respect to dependent claims 224 and 235, Applicant claims an apparatus comprising one or more acoustic wave transducers having a selected transparent frequency, wherein the transparent frequency is a selected frequency of acoustic energy in which the wafer is transparent to the acoustic energy having the selected frequency. In contrast, *Lorimer* only discloses that ultrasonic transducers may be optionally attached to the underside of the platen portion 98. Col. 9, lines 41-21. Therefore, *Lorimer* fails to disclose or suggest a transparent frequency, which minimizes sonic wave reflections in the wafer, and in which the wafer is transparent to.

Applicant, therefore, respectfully requests removal of the 35 U.S.C. 102(e) rejections of claims 224 and 235 and seeks an early allowance of these claims.

Claim Rejections - 35 U.S.C. § 103

The Examiner has rejected claims 12-14, 16, 18, and 228 under 35 U.S.C. § 103(a) as being unpatentable over *Lorimer* in view of *Busnaina* (WO 0021692) and JP 05-013396. The Examiner has rejected claims 221-223, 227, 232-234, and 238 under 35 U.S.C. § 103(a) as being unpatentable over *Lorimer* in view of *Puskas* (US Patent No. 6,313,565), *Hyamizu* (US 20020157685) and *Ferrell* (US Patent No. 6,036,785).

Claims 12-14, 16, 18, and 228

The Examiner has rejected claims 12-14, 16, 18, and 228 under 35 U.S.C. § 103(a) as being unpatentable over *Lorimer* in view of *Busnaina* (WO 0021692) and JP 05-013396. In view of the above remarks, a specific discussion of dependent claims 12-14, 16, 18, and 228 is considered to be unnecessary. Therefore, Applicant's silence regarding any dependent claim is not to be interpreted as agreement with, or acquiescence to, the rejection of such claim or as waiving any argument regarding that claim. Nonetheless, the following remarks regarding the Examiner's rejections may be helpful to expedite prosecution.

Applicant claims in dependent claim 16 an apparatus comprising one or more acoustic wave transducers having a selected transparent frequency, which minimizes sonic wave reflections in the wafer and confers the additional benefits of improving the effectiveness of the clean and reduces power losses into the wafer, wherein the transparent frequency is a selected frequency of acoustic energy in which the wafer is transparent to the acoustic energy having the selected frequency. "The frequency of 5.4 MHz has a **special utility** in that the 300 mm wafer 506 is transparent for those sound waves. At 5.4 MHz +/- 30%, the sound waves can travel substantially through the wafer 506 to exit the opposite wafer surface" [0065]. "These frequency waves transmit **almost without any reflection through the platter and the wafer** to the wafer side not facing the platter, i.e. **transparent frequency**" [0080]. Thus, Applicant teaches that the transparent frequency is **critical** for reducing reflections of the acoustic energy.

The Examiner relies on *Busnaina* and JP 05-013396 stating the claimed operation frequencies were conventional and preferred for providing efficient cleaning, and that it would have been obvious to have the frequencies in order to achieve adequate cleaning in a relatively short time. Applicant agrees with the Examiner that JP 05-013396 teaches that it is conventional to utilize frequencies in the range of 100 kHz to 10MHz in cleaning operations (see paragraph [0012]). However, the particular transparent frequency of 5.4 MHz for a 300 mm wafer provides **new and unexpected results relative to the references cited by the Examiner**. *Busnaina* and JP 05-013396 merely disclose broad ranges of frequencies but fail to recognize the **unexpected result** of generating a **transparent frequency which allows transmission of the acoustic energy almost without any reflection**. Therefore, Applicant respectfully submits that the prima facie case of obviousness based on overlapping ranges is effectively rebutted by a showing of the **criticality** of the transparent frequency, something which **achieves unexpected results** relative to the broad ranges provided by *Busnaina* and JP 05-013396. See M.P.E.P. § 2144.05(III) (Rebuttal of Prima Facie Case of Obviousness).

Applicant, accordingly, respectfully requests withdrawal of the rejection of claim 16 under 35 U.S.C. § 103(a) as being unpatentable over *Lorimer* in view of *Busnaina* and JP 05-013396.

Claims 221-223, 227, 232-234, and 238

The Examiner has rejected claims 221-223, 227, 232-234, and 238 under 35 U.S.C. § 103(a) as being unpatentable over *Lorimer* in view of *Puskas* (US Patent No. 6,313,565), *Hyamizu* (US 20020157685) and *Ferrell* (US Patent No. 6,036,785), stating it would have been obvious to an ordinary artisan at the time the invention was made to provide transducers operating in different frequencies in the apparatus of *Lorimer* in order to enhance the cleaning action of the apparatus with reasonable expectation of success because *Puskas* and *Ferrell* recommend such. In view of the above remarks, a specific discussion of dependent claims

221-223, 227, 232-234, and 238 is considered to be unnecessary. Nonetheless, the following remarks regarding the Examiner's rejections may be helpful to expedite prosecution.

Applicant claims in claims 221-223 and 232-234 an apparatus which comprises a plurality of acoustic wave transducers which are capable of **simultaneously** transmitting a **plurality** of frequencies.

It is Applicant's understanding that *Hayamizu* discloses an ultrasonic washing method in which two frequencies may be sequentially applied to a wafer, but not simultaneously.

It is Applicant's understanding that *Puskas* discloses a **bath cleaning system** which generates a plurality of non-overlapping frequencies in liquid 22 which is contained in a **tank 20**. The bath cleaning system of *Puskas* cleans wafers in an entirely different manner than the spinning single wafer cleaning system of *Lorimer*. In addition, the transducers 17, 18, and 19 of *Puskas* are attached to the tank frame 20 (see Figure 1A). Applicant respectfully submits that the art of record does not teach, and one of ordinary skill in the art would not be motivated, to alter the single wafer cleaning apparatus of *Lorimer* to include the multiple transducers from the bath cleaning system of *Puskas*. Further, because the systems are entirely different in their modes of operation, there would be no reasonable expectation of success in the proposed combination. *Puskas* is entirely void of the concept of attaching transducers to a platter.

It is Applicant's understanding that *Ferrell*, like *Puskas*, discloses a **bath cleaning system**. The bath cleaning system of *Ferrell* cleans wafers in an entirely different manner than the spinning single wafer cleaning system of *Lorimer*. In addition, the ultrasonic frequency generators 25A and 25B of *Ferrell* are attached to the container frame 13 (see Figure 1). Applicant respectfully submits that the art of record does not teach, and one of ordinary skill in the art would not be motivated, to alter the single wafer cleaning apparatus of *Lorimer* to include the multiple transducers from the bath cleaning system of *Ferrell*. Further, because the systems are entirely different in their modes of operation, there would be

no reasonable expectation of success in the proposed combination. *Ferrell* is entirely void of the concept of attaching transducers to a platter.

Accordingly, Applicant urges that the bath cleaning systems of *Puskas* and *Ferrell* are not combinable with *Lorimer* and *Hayamizu*. Furthemore, the resulting combination of *Lorimer* and *Hayamizu,* fails to disclose each and every element as claimed by Applicant, because neither of the references, alone or in combination, teach the element of a plurality of acoustic wave transducers which are capable of **simultaneously** transmitting a **plurality** of frequencies.

Applicant, therefore, respectfully requests removal of the 35 U.S.C. 103(a) rejections of claims 221-223 and 232-234.

Pursuant to 37 C.F.R. 1.136(a)(3), applicant(s) hereby request and authorize the U.S. Patent and Trademark Office to (1) treat any concurrent or future reply that requires a petition for extension of time as incorporating a petition for extension of time for the appropriate length of time and (2) charge all required fees, including extension of time fees and fees under 37 C.F.R. 1.16 and 1.17, to Deposit Account No. 02-2666.

Respectfully submitted,

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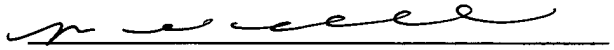
Date: December 17, 2007



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